

What is claimed is:

1. A method for removing a protective group from a synthesis intermediate comprising the steps of:

a) forming a surface comprising

i) a photosensitive compound or group, said photosensitive compound or group producing a catalyst when irradiated, and

ii) an autocatalytic compound or group, said autocatalytic compound or group generating a protecting group removing product when said autocatalytic compound is activated by said catalyst; and

b) irradiating at least a part of said surface to remove said protecting group.

2. The method recited in claim 1 wherein said photosensitive compound is a PAC.

3. The method recited in claim 1 wherein said autocatalytic compound is a masked acid.

4. The method recited in claim 1 wherein said autocatalytic compound is a pentafluorobenzoic acid.

5. The method recited in claim 1 wherein said synthesis intermediate is a linker molecule.

6. The method recited in claim 1 wherein said synthesis intermediate is a DMT protected nucleotide.

7. The method recited in claim 1 wherein said synthesis intermediate is a nucleotide.

8. The method recited in claim 1 wherein said synthesis intermediate is an polynucleotide.

9. The method recited in claim 1 wherein said synthesis intermediate is an amino acid.

10. The method recited in claim 1 wherein said synthesis intermediate is an polypeptide.

11. The method recited in claim 1 wherein said removable protecting group is an acid removable group.

12. The method recited in claim 1 wherein said photosensitive compound is toluenesulfonic acid.

13. The method recited in claim 1 wherein said autocatalytic compound is pentafluorobenzoic acid.

14. The method recited in claim 1 wherein said removable protecting group is 5' dimethoxytrityl.

15. The method recited in claim 1 wherein said photosensitive group and said autocatalytic group are parts of the same compound.

16. The method recited in claim 1 wherein said photosensitive group is a PAC.

17. A method for synthesizing polymers of diverse sequences comprising the steps of:

a) forming a surface comprising

i) a photosensitive compound or group, said photosensitive compound or group producing a catalyst when irradiated, and

ii) an autocatalytic compound or group, said autocatalytic compound or group generating a protecting group removing product when said autocatalytic compound is activated by said catalyst;

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- b) irradiating at least a part of said surface to remove said protecting group;
 - c) contacting the surface with a first monomer;
 - d) irradiating at least another part of said surface to remove said protecting group; and
 - e) contacting the surface with a second monomer.

10 18. The method recited in claim 17 wherein said photosensitive compound is a PAC.

19. The method recited in claim 17 wherein said autocatalytic compound is a masked acid.

15 20. The method recited in claim 17 wherein said synthesis intermediate is a linker molecule.

21. The method recited in claim 17 wherein said synthesis intermediate is a nucleotide.

22. The method recited in claim 17 wherein said synthesis intermediate is an polynucleotide.

20 23. The method recited in claim 17 wherein said synthesis intermediate is an amino acid.

24. The method recited in claim 17 wherein said synthesis intermediate is a polypeptide.

25. The method recited in claim 17 wherein said removable protecting group is an acid removable group.

26. The method recited in claim 17 wherein said photosensitive compound is a toluenesulfonic acid.

5 27. The method recited in claim 17 wherein said autocatalytic compound is a pentafluorobenzoic acid.

28. The method recited in claim 17 wherein said acid removable protecting group is 5' demethoxytrityl.

10 29. An apparatus for solid phase chemical synthesis comprising a substrate comprising:

- i) a synthesis intermediate comprising a removable protecting group;
- ii) a photosensitive compound or group, said photosensitive compound or group producing a catalyst when irradiated, and
- 15 iii) an autocatalytic compound or group, said autocatalytic compound or group generating a protecting group removing product when said autocatalytic compound is activated by said catalyst.

20 30. The apparatus recited in claim 29 wherein said photosensitive compound is a PAC.

31. The apparatus recited in claim 29 wherein said autocatalytic compound is a masked acid.

32. The apparatus recited in claim 29 wherein said synthesis intermediate is a linker molecule.

33. The apparatus recited in claim 29 wherein said synthesis intermediate is a nucleotide.

34. The apparatus recited in claim 29 wherein said synthesis intermediate is an polynucleotide.

5 35. The apparatus recited in claim 29 wherein said synthesis intermediate is an amino acid.

36. The apparatus recited in claim 29 wherein said synthesis intermediate is an polypeptide.

10 37. The apparatus recited in claim 29 wherein said removable protecting group is an acid removable group.

38. The apparatus recited in claim 29 wherein said PAC is toluenesulfonic acid.

39. The apparatus recited in claim 29 wherein said autocatalytic compound is pentafluorobenzoic acid.

15 40. The apparatus recited in claim 29 wherein said acid removable protecting group is 5' dimethoxytrityl.

41. A method for hybridizing nucleic acid comprising the steps of:

a) forming a surface comprising

20 i) a photosensitive compound or group, said photosensitive compound or group producing a catalyst when irradiated, and

ii) an autocatalytic compound or group, said autocatalytic compound or group generating a protecting group removing product when said autocatalytic compound is activated by said catalyst;

b) irradiating at least a part of said surface to remove said protecting group;

- c) contacting the surface with a first monomer;
d) irradiating at least another part of said surface to remove said protecting group;
e) contacting the surface with a second monomer;
f) repeating steps a to e to synthesize polynucleotide arrays of desired length;
and
g) hybridizing a target nucleic acid to said polynucleotide arrays.

42. The method recited in claim 41 wherein said synthesis intermediate is a linker molecule.

43. The method recited in claim 41 wherein said synthesis intermediate is a nucleotide.

44. The method recited in claim 41 wherein said synthesis intermediate is an polynucleotide.

45. The method recited in claim 41 wherein said removable protecting group is an acid removable group.

46. The method recited in claim 41 wherein said photosensitive compound is a toluenesulfonic acid.

47. The method recited in claim 41 wherein said autocatalytic compound is a pentafluorobenzoic acid.

48. The method recited in claim 41 wherein said acid removable protecting group is 5' dimethoxytrityl.

49. A method for synthesizing a polymer array on a substrate comprising the steps of:

- a) providing a surface of the substrate having one or more synthesis intermediates bound thereon and a catalyst system, the synthesis intermediates having a reactive group protected from reaction by a protective group;
- b) irradiating the surface of the substrate with radiation of certain wavelength;
- c) initiating a catalytic reaction to remove the protective group from the synthesis intermediates to produce unprotected reactive groups;
- d) reacting a subsequently added synthesis intermediate with the unprotected reactive group, the subsequently added synthesis intermediate having a reactive group protected from reaction by a protective group;
- e) repeating steps b) through d), or not, until a desired polymer sequence is obtained.

50. A substrate for use in making a polymer array comprising:

- a) a substrate having one or more synthesis intermediates bound thereon, the synthesis intermediates having a reactive group protected from reaction by a protective group;
- b) a catalyst system contacting the synthesis intermediates and being capable of catalyzing removal of the protective group.

51. A method of making a substrate for use in making a polymer array comprising:

a) providing a substrate surface having one or more synthesis intermediates bound there n, the synthesis intermediates having a reactive group protected from reaction by a protective group;

b) applying over the substrate surface a polymer layer having a catalyst system capable of catalyzing removal of the protective group.

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